University of Technology Sydney

Preserving Lumbar Spine Health for the Australian Cleaning Industry

By

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A thesis submitted for the degree of Doctor of Philosophy

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0.1 Certificate of Original Authorship

I, Denis Boulais declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Faculty of Science at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all the information sources and literature used are indicated in the thesis.

This document has not been submitted for qualification at any other academic institution.

This research is supported by the Australian Government Research Training Program.

Production Note:
Signature removed prior to publication.

Denis Patrick Boulais

Date: 25.08.20

0.2 Acknowledgements

This research is supported by an Australian Government Research Training Program Scholarship and I would like to thank the Australian Government for this research opportunity. I would also like to thank Broadlex Services for their support and permission to use Company resources to complete this study.

I would like to thank my PhD supervisor, Dr Tamara Sztynda and co-supervisors' Associate Professors Christopher Zaslawski and Sara Lal, for their advice and assistance over the duration of this study. I would also like to thank UTS Professor James Brown (ABS Professor of Official Statistics) for his advice on statistics used throughout this study. I would also like to thank my parents, wife and three daughters for their patience and support throughout the duration of this study.

In 2017, I was the joint winner of the University of Technology Dr Loraine Holley essay prize. The left photo below illustrates Dr Tamara Sztynda (left), myself (middle) and Dr Loraine Holley (right).

My family is pictured in the right photo (Christmas 2018). From left to right, Samantha, Alyssa, Jessica and Michelle Boulais.

I would like to thank the following conference organisers for allowing me the opportunity to present my findings at their events over the period of my PhD candidature.

- Clean New Zealand Conference (Auckland) (May 2016) (Interpoint Events).
- ISSA Cleaning and Hygiene Expo (Melbourne) (May 2017) (ISSA).
- Australian Safety Systems Conference (Sydney) (May 2017) (ACS).
- Safety Connect (Sydney) (August 2018) (NSCA).
- Building Services Contractors Association of Australia (March 2019) (BSCAA).

Picture Top Left (My presentation at the ISSA Cleaning and Hygiene Expo).
Picture Top Right (My presentation at Clean NZ).
Picture Bottom (My presentation at BSCAA).

Because my study is a strong hybrid of academia and industry, it was important that I publish my findings in academic and industry publications. This approach ensures my findings shall reach many thousands of readers in the cleaning industry throughout Australasia.

Firstly, I would like to thank the peer reviewed Journal of Health, Safety and Environment for publishing this study's findings as per:

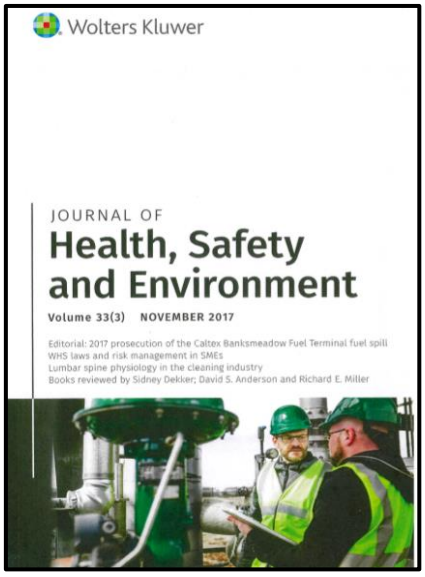
Boulais. D, S. Lal, Sztynda. T and C. Zaslawski. 2017. Preserving lumbar spine physiology in the cleaning industry. *Journal of Health, Safety and Environment*. 33:347-346.

As Australasia's peak publication in this area then I am proud to be associated with this Journal.

Secondly, I would also like to thank Inclean Magazine which is Australia's peak cleaning industry publication. Over the period of my PhD candidature I have had a regular two monthly safety section in this industry publication and the findings of this study were published in their 30th year anniversary edition.

Picture Left (The Journal of Health, Safety and Environment)

Picture Right (Inclean Magazine 30 year edition)



0.3 Abstract

Lumbar spine disc breakdown may begin as early as the second decade of life. Peak bone mass occurs between the ages of 16 and 25 years and continuously decreases thereafter increasing risk of injury as we age. The main objective of this study was to identify, assess and control hazards in the cleaning industry with a view to reducing risk and improving the recovery of injured workers.

The records of 144 musculoskeletal disorder (MSD) related incidents that were recorded between 2012 and 2016 (five years) were retrieved from the injury register of a large commercial cleaning organisation (n=700) for analysis. Furthermore, cleaners (n=220) and their managers (n=30) underwent a random voluntary survey to ascertain their knowledge of manual handling.

It was identified that summer had the higher frequency of MSDs, 44 of 144 (30.55%). This highlighted the need for preventative strategies such as training and activity around fatigue management and maintenance of hydration.

It was also found that 76 of 144 (52.77%) of MSD injuries occurred within the first two hours of a cleaner's shift. Hence it is recommended that the cleaning industry implement pre-start warm-up strategies to reduce MSD.

A significant relationship was identified between the age of cleaners (younger or older than 45 years) and musculoskeletal disorders (MSDs) (lumbar or non-lumbar MSD) χ^2 (df=1, N=144) = 4.8997, $p<0.05$. This finding suggests training in lower back protection should be prioritised.

Incident investigations showed that training was the most common level of risk control measure implemented on 124 (86.11%) of occasions. This suggests that training is well grounded within the organisation and in future should have a competency based focus. It was recommended that training focus on risk controls and take a participatory/consultative approach.

Surveys of staff identified that cleaners and managers require focused training in the areas of safe use of equipment and lifting. This led to the recommendation that training programs must be competency-based, primarily due to the industry's lower level of education and the predominance of non-English speaking background workers.

In summary, the cleaning industry requires a strong focus upon hydration and fatigue programs, pre-start warm-up programs, and competency-based training. This training should have a focus upon hazard identification, safe use of equipment, safe lifting, risk control and workers participation/consultation.

Addressing these objectives will have a strong positive impact upon achieving the main research objective of identifying, assessing and controlling hazards in the cleaning industry.

0.4 Table of Contents

0.5 List of Tables

0.6 List of Figures and Case Studies

0.7 List of Abbreviations

Abbreviation	Full Name
AS	Australian Standard
BSCAA	Building Services Contracting Association of Australia
CAF	Cleaning Accountability Framework
ECG	Electrocardiogram
HACCP	Hazard Analysis and Critical Control Points
ISO	International Standards Organisation
LART	Lift Assisted Rubbish Trolley
LTI	Lost Time Injury
LTID	Lost Time Injury Duration
LTIFR	Lost Time Injury Frequency Rate
MSD	Musculoskeletal Disorder
MTI	Medically Treated Injury
N&C	Nature and Conditions
NESB	Non-English Speaking Background
NSCA	National Safety Council of Australia
NSW	New South Wales
NZS	New Zealand Standard
OHS	Occupational Health and Safety
OOS	Occupational Overuse Syndrome
PPE	Personal Protective Equipment
RCD	Residual Current Device
REBA	Rapid Entire Body Assessment
RSI	Repetitive Strain Injury
RTO	Registered Training Organisation
RULA	Rapid Upper Limb Assessment
SDS	Safety Data Sheet
STI	Soft Tissue Injury
WHS	Work Health and Safety